Statistical Inference

Worksheet 2:

1. Suppose that 10% of individuals in a given population are known to have kidney problems and 25 individuals are randomly extracted from this population. Using a suitable table or calculator, among the chosen individuals, compute the probability that,

   (a) five or less have kidney problems?

   (b) six or more have kidney problems?

   (c) between six and nine (inclusive) have kidney problems?

   (d) two, three or four have kidney problems?

2. The probability that a person with a migraine will improve with a certain drug is 0.9. Suppose the drug was administered to thirteen people with migraine (chosen at random). What is the probability that the number of people who get better from migraine are:

   (a) exactly seven?

   (b) exactly six?

   (c) greater than seven?

   (d) no more than eight?

   (e) between four and eleven, inclusive?

   (f) not less than ten?

   (g) greater than the number of people who do not improve?

3. A study carried out in a certain population showed that, on average, 13 new cases of esophageal cancer are diagnosed per year. If the annual incidence (number of new cases) of esophageal cancer follows a Poisson distribution, determine the probability that, in a given year, the number of new cases of this type of cancer is:

   (a) exactly 10

   (b) at least 8

   (c) no more than 12

   (d) less than 7

   (e) between 9 and 15, inclusive.

4. The weight, X, of a population of women of an Indian community aged between 18 and 40 years follows approximately a normal distribution. of average 60 Kg and standard deviation 12 Kg.

   (a) compute the probability that a woman selected at random from among this population weighs:

      (a.1) exactly 60 kg

      (a.2) more than 70 kg

      (a.3) 54 kg or less

      (a.4) between 55 and 65 kg

      (a.5) maximum 60 kg.

   (b) Determine:

(b.1) $X_{0.75}$

(b.2) x_1 such that $P(X \leq x_1) = 0.1539$.

5. The weight of the apples produced on a farm in northern Portugal, in a given year, had an average value of 170 g and a deviation 24 gr standard.

   (a) Compute the probability of 50 randomly chosen apples of this production can have an average weight:

   (a.1) of 170 g

   (a.2) that varies between 160 and 180 gr

   (a.3) higher than 180.

   (b) For another farm, the average weight of the apples produced that same year was 165 gr. Knowing that the probability of getting an average weight for apples greater than 162 g in samples of size 50 was 0.9505, determine the standard deviation of the weight of the apples from this second farm.

6. The weights of packets received by a department from a certain hospital presented an average of 150 kg and a standard deviation of 25 kg. What is the probability that 25 packages are chosen at random and once placed in an elevator exceed the safety limit of the elevator, set at 4100 Kg?